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INSTRUMENTS THAT STAY ACCURATE

OPERATOR'S MANUAL

MULTICORDER MODEL 604

SIMPSON ELECTRIC COMPANY

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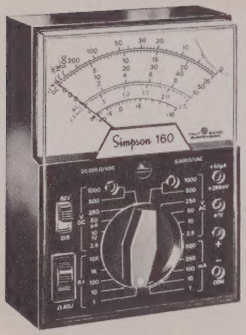
new VOM's from Simpson



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Just 3 5/16" Wide . . .
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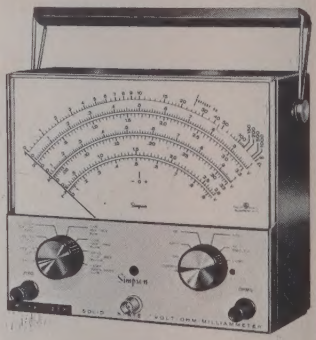
- 20,000 Ω VDC . . . 5,000 Ω VAC
- ±2% DC . . . ±3% AC
- 5 Resistance Ranges . . . Plus a 0-250 DC Millivolt Range



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- Uses a single 9-volt battery
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OPERATOR'S MANUAL

MULTICORDER

MODEL 604

SIMPSON ELECTRIC COMPANY

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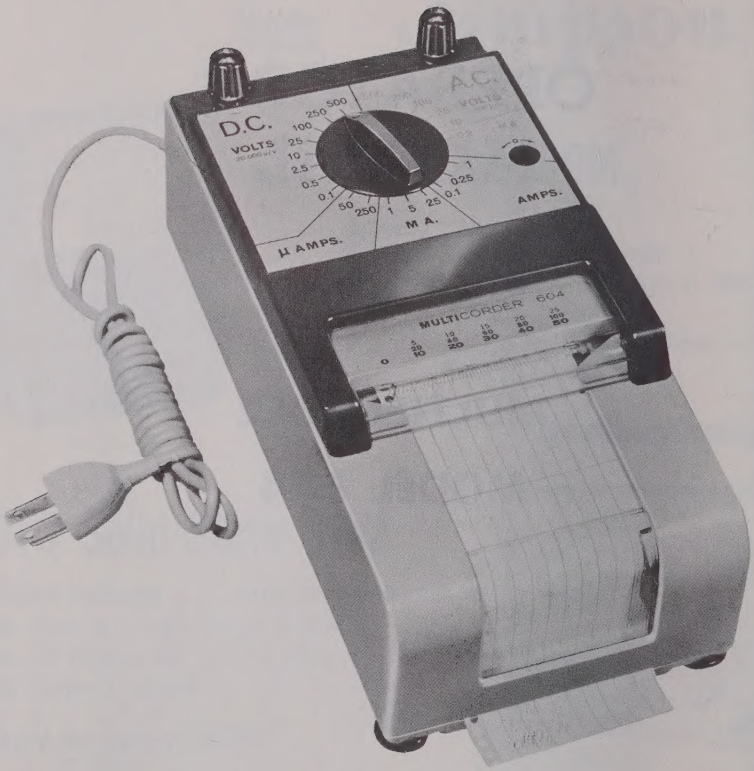

FIG. 1: SIMPSON MULTICORDER ◆ MODEL 604
VOLT-AMP-MILLIAMP-MICROAMP RECORDER

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CAUTION!

The Model 604 MULTICORDER is delivered with the chopper bar in locked position. To put into operation for recording, release the locking device of the chopper bar (see Fig. 6).

GENERAL DESCRIPTION

The Model 604 MULTICORDER is an accurate, compact, and easy to operate instrument, combining the advantages of a portable multi-range measuring instrument with those of a recording device.

The Model 604 MULTICORDER is simple and rugged in design, utilizing modern components and techniques, permitting ease of operation. Inkless recording by using fast sequential impressions on pressure sensitive strip chart paper eliminates the problem of pen and ink maintenance, and also permits instant visual observation of measured values. A special device marks the range being measured on the chart paper in addition to the recorded value, thus making a permanent record both of range and measured value.

The Model 604 MULTICORDER, with its range coverage of low D.C. currents and its high internal resistance is particularly suited to the measurement of electrical characteristics of circuits. Accurate quantity measurements and permanent recordings of D.C. and A.C. voltages and currents can be made.

The Model 604 MULTICORDER features a high torque meter movement, with a shockproof, taut band suspension moving coil system. Electrical protection of the instrument

is provided by protective diodes and a 1 amp. fuse to aid in preventing high currents from damaging the meter and measuring circuits.

The Model 604 MULTICORDER has a range switch located in the center of the panel. It can be turned in either direction to obtain any desired range and circuit position. Two binding posts are provided which will accept the prods of the test lead set. The binding posts are marked (+) and (−) and the test leads are color coded (red and black) for easy polarity identification.

MEASURING RANGES

DC – 20,000 ohms per volt
AC – 5,000 ohms per volt

DC Voltage		DC Current	
Range	Internal Resist.	Range	Voltage Drop
500 volts	10 megohms	1 amp	0.35 volts
250 volts	5 megohms	0.25 amp	0.20 volts
100 volts	2 megohms	0.1 amp	0.18 volts
25 volts	500,000 ohms	25 milliamp	0.17 volts
10 volts	200,000 ohms	5 milliamp	0.17 volts
2.5 volts	50,000 ohms	1 milliamp	0.16 volts
0.5 volts	10,000 ohms	250 microamp	0.14 volts
0.1 volt	2,000 ohms	50 microamp	0.10 volts

AC Voltage		AC Current	
500 volts	2.5 megohms	0.2 milliamp	0.45 volts
250 volts	1.25 megohms		
100 volts	500,000 ohms		
25 volts	125,000 ohms		
10 volts	50,000 ohms		

MEASURING SYSTEM SPECIFICATIONS

The moving coil system, with a taut band suspension movement, has a response time of less than 1.5 seconds. A.C. measurements up to 20,000 Hz are made by means of a full-wave rectifier with germanium diodes.

	percent of full scale
Accuracy of indication:	
D.C.	±1.5
A.C. (sinusoidal A.C. 45 to 65 Hz)	±1.5
Accuracy of recording:	±2.5
Temperature Influence	
D.C. – for 10°C change (18° F)	1 max (% of true value)
A.C. – for 10° C change (18° F)	1 max
(Influence is positive from 0 to 20° C, (32 to 68° F) and negative from 20 to 50° C, (68 to 122° F))	
Frequency influence:	
No additional error from 15 to 10,000 Hz	
2.5% of full scale from 10,000 to 20,000 Hz	
Influence of Wave Form	
Instrument calibrated in effective values of a sinusoidal wave. Form factor of 1.11 for sinusoidal A.C. taken into account. (Deviations from a sine wave may cause an error).	

Dielectric Test Voltage:

The instrument is designed to withstand 2000 V.A.C. between the measuring circuitry and any part of the case.

Overload Protection:

The measuring circuits are protected by a 1 ampere fuse (0.2 in. dia. x 1 in. long). (2 spare fuses are included with instrument).

Zero position of pointer can be shifted up to 30% of scale length if negative quantities are to be expected.

RECORDING SYSTEM SPECIFICATIONS

Recorder:

Chart paper and chopper bar action can be driven either by the self-contained synchronous motor or by external driving means. The following types of drive can be selected by appropriate settings of lever II (Fig. 3).

M – Chart drive and chopper bar action by self-contained synchronous motor.

E – Chart drive by external drive, chopper bar action by self-contained synchronous motor.

O – Chart drive and chopper bar by external drive.

Motor Drive:

Self-starting synchronous motor, 115 volts, 60 Hz, contained in recorder. Grounded line cord is provided with recorder.

Chart Speed:

	Chart Speeds	Part Number
Standard gear unit	1/3/12 inch/hour	5-110681
Special fast gear unit	30/60/90 inch/hour	5-110682

Chart impressions are made every two seconds.

Required Data for External Drive:

(See coupling shaft for external drive, Fig. 3, Page 10).

Gear Unit	Standard	Special
Torque; lever in position O	0.7 in-lb. approx.	0.3 in-lb approx.
Torque; lever in position E	0.09 in-lb. approx.	0.1 in-lb approx.
Speed to obtain listed chart speeds	30 rev/hour	2 rev/min
Direction of rotation	Clockwise	

Chart Paper:

Type – Pressure sensitive.

Width of recording – 2.3 inches.

Length of paper on roll – 50 feet approximately.

Divisions – 50.

Range imprint – every 12 inches.

Time imprint – every inch – numbered 1 through 12.

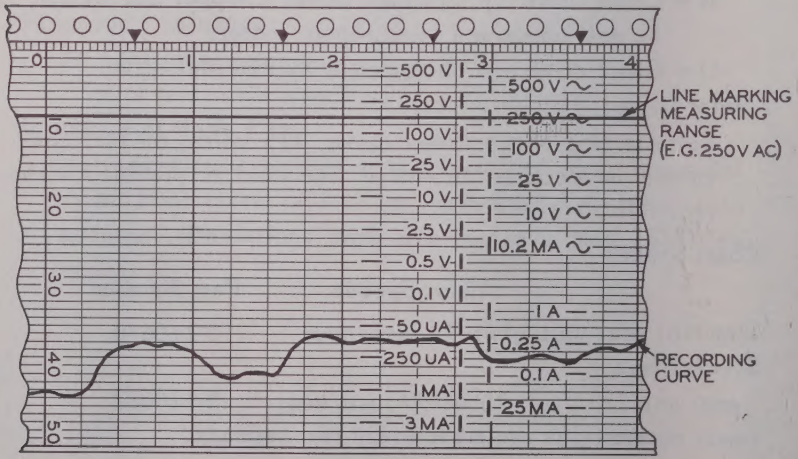

FIG. 2. CHART PAPER

OPERATION

INSERTION OF CHART PAPER (See Fig. 3, page 10 for identification of parts.)

Loosen knurled locking screws on base of instrument, lift hinged upper part; then press down holding catches on both sides of feed spool, lift out feed spool. Install new chart roll with the perforation on the flange side and shift it until it contacts flange. When reinserting feed spool, check correct position (perforations on the left). Pull off about 8 inches of paper from chart roll, pull back chart-guides and insert the chart so that the pins of the drive spool engage the perforations of the paper. Tighten strip by turning knurled flange on feed spool. The chart strip should extend beyond the edge of the base-plate of the instrument for proper operation.

ADJUSTMENT OF TIME SCALE ON CHART

Instrument Opened: Turn knurled wheel of drive spool (see Fig. 3) in the direction of chart-motion until desired time-line coincides with recording edge.

Instrument Closed: Carefully pull out extending end of chart until scale marked "▶—" coincides with that mark "▶" on chart which is positioned before the desired time line.

SELECTION OF DRIVE

Set lever II (see Fig. 3) to "M" position. (When an external drive is used, please follow instructions on page 7.)

SELECTION OF CHART SPEED

Move lever I (see Fig. 3) into slot corresponding to chart speed desired. Three speeds are available with each gear unit.

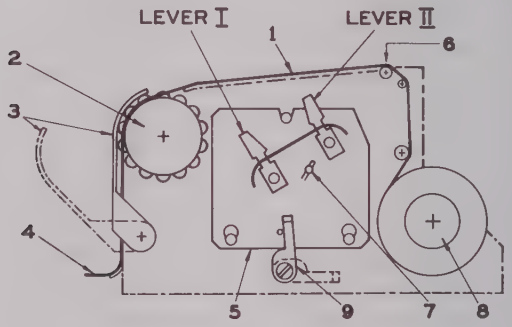

FIG. 3. CHART DRIVE

1. Desk (can be raised on its hinges)
2. Drive spool with knurled wheel
3. Chart guides (closed and pulled back)
4. Chart paper
5. Exchangeable gear unit (before removing, place lever II to position O).
6. Recording edge
7. Coupling shaft for external drive (shaft dia. 0.118 inches; pin dia. 0.040 inches)
8. Feed spool
9. Clamping lever

GEAR UNIT EXCHANGE (Changing Chart Speeds)

(For details on specific chart speeds, see information on Page 7). Engage lever II in the slot marked "O". Then

swivel clamping lever down, which unlocks gear unit. (Refer to Fig. 3). Push down on gear unit so guide pins are free, and pull out to the right. Prior to inserting new gear unit, place lever II in the "O" position. Then insert new unit, properly line up guide pins, and lift up for correct positioning. Finally, return clamping lever to its original position and place lever II into desired operating position. (If necessary, the desk can be raised to aid this operation).

The base has slots allowing permanent mounting. For best accuracy, recorder should be mounted in horizontal position. See Fig. 4 for dimensions.

GENERAL TECHNICAL INFORMATION ON MEASUREMENTS

To achieve maximum accuracy place instrument in a horizontal position, out of strong magnetic fields. Check zero adjustment (see also Measuring System Specifications). For this – and also for use as an indicating instrument – the chopper bar should be put out of operation by moving upward the lever of the locking device (see Fig. 6, page 16).

Connect test leads, set range selector to the voltage or current range desired, and connect to measuring circuit. When in doubt as to the voltage or current present, always use the highest range as a protection to the instrument. Observe meter reading. If the indication is within a lower range, the switch may be set for the lower range to obtain a more accurate reading. To start recording, connect power cord to 115 V. A.C. source.

In current measurements, if possible connect instrument to that conductor which has the lower potential to ground (maximum 650V).

After all measurements are completed, the range selector switch should be returned to the highest voltage range.

A.C. CURRENT AND VOLTAGE MEASUREMENTS UP TO 20,000 HZ

Connect the "minus" terminal of instrument directly to ground if possible, or the point with the lowest potential above ground. In the case of higher frequencies, input capacitance causes a lowering of the internal resistance (R_i).

The input capacitance is about 40 pico-farads.

SUPERIMPOSED DC AND AC MEASUREMENTS

Direct current and voltage components can be measured according to the General Instructions. The range selected should not be smaller than the superimposed A.C. component.

For measuring of superimposed alternating voltage, block off the D.C. component by means of a suitable condenser (e.g. 0.1 uf/500V DC). Lower frequencies will make the indication frequency-dependent; the change of indication can be calculated as follows:

$$\triangle = - \frac{1.25 \times 10^{12}}{f^2 \times R_i^2 \times C^2}$$

Where $\triangle$ = change in indication in per cent
f = frequency in Hz
R_i = Internal resistance in ohms
C = Capacity in microfarads

MAINTENANCE

The recorder requires little maintenance. Every 1000 hours, lubrication of the drive bearings with a light oil, such as 3 in 1, or sewing machine oil, is recommended.

Deposits of dust from the chart paper on the scale and the chopper bar should be removed from time to time with a soft brush.

ACCESSORIES

		Part Number
Gear Unit	1/3/12 inch per hour (Std.)	5-110681
Gear Unit	30/60/90 inch per hour	5-110682
Feed Spool		5-110683
Chart Paper	Time scale in inches Available in quantities of 10	02612
Fuse, 1 amp		5-110684
Test Lead Set		7500
Leather Carrying Case		02611

ACCESSORIES (continued)

	Part Number
Shunt 600-300-120 Amps, Accuracy 0.5% (60-30-12 MV) 600 A/60 MV Max.	06529
Shunt 60-30-12 Amp, Accuracy 0.5% (60-30-12 MV) 100 A/100 MV Max.	06531
Terminal Lug, For Shunts (2 Req'd for external leads)	06532
Current Transformer Clip on type, (2000:1 turns ratio) 600-120-30 Amps A.C. (0.3A-60-15 MA. A.C.) Accuracy ±3% (45-65 Hz).	02461
Current Transformer Clip on type, (10,000:1 turns ratio) 600-150-30 Amps A.C. (60-15-3 MA A.C.) Accuracy ±1% (45-65 Hz)	02462

NOTE: Model 604 Recorder is supplied with two rolls of chart paper, one feed spool, one test lead set, and two extra fuses.

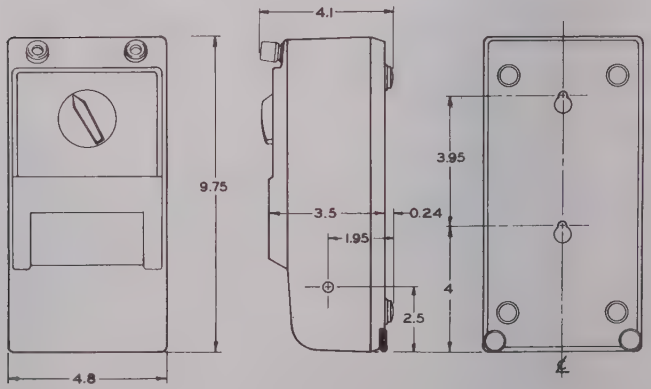

FIG. 4. DIMENSIONAL DIAGRAM; WEIGHT 5.5 LBS.

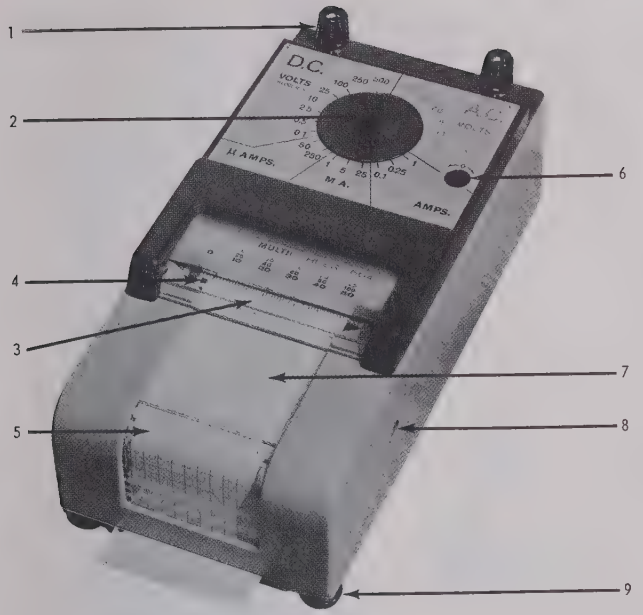

FIG. 5. MULTICORDER, CLOSED

1. Binding Posts
2. Range Selector Switch
3. Scale
4. Pointer
5. Plexiglass Cover
6. Zero-adjustment Screw
7. Writing Desk (for making notes on chart)
8. Opening for external drive
9. Knurled locking screws of case

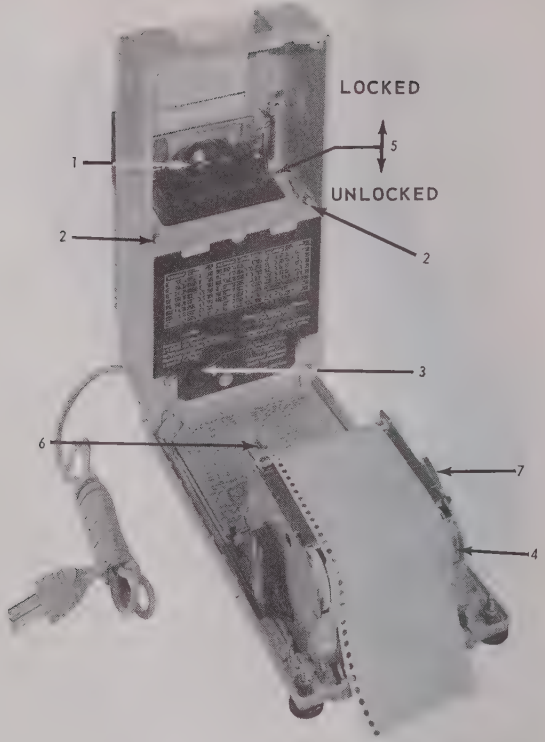

FIG. 6. MULTICORDER, OPEN

1. Taut Band Movement Housing
2. Spare Fuses
3. Fuse Receptacle
4. Chart Guide
5. Locking Device for Chopper Bar
6. Aperture for Mounting Instrument
7. Switch Panel

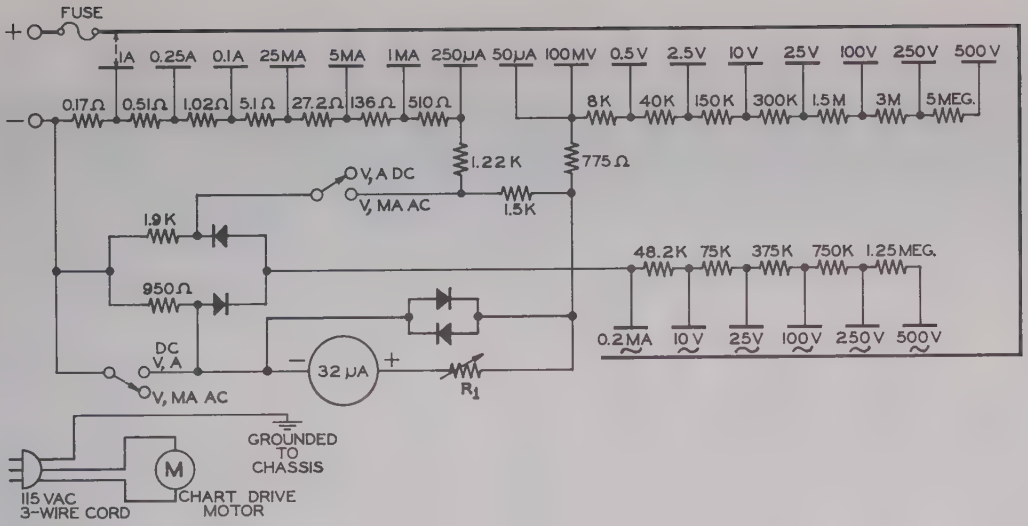

FIG. 7 OVERALL SCHEMATIC

MODEL 604

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

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California, Los Angeles 90022 Metermaster/Los Angeles Division of Kierulff Elec., Inc. 5645 E. Washington Blvd.	Area Code 213 685-4340
California, Los Angeles 90007 Quality Electric Division of Kierulff Elec., Inc. 3700 South Broadway	Area Code 213 232-3501
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California, San Diego 92111 Metermaster/San Diego 8137 Engineer Road	Area Code 714 276-5202
California, San Francisco 94105 Pacific Electrical Instrument Lab. 111 Main Street	Area Code 415 421-7185
Canada, London, Ontario Bach-Simpson Ltd. 1255 Brydges Street P.O. Box 484	Area Code 519 451-9490
Colorado, Denver 80209 Metermaster Instrument Corporation 748 So. Broadway	Area Code 303 722-5766
Connecticut, Middletown Mancib Company Randolph Road—PO Box 467	Area Code 203 Diamond 7-5629

Connecticut, New Haven 06511 Kaufman Instrument Labs Inc. 810 Dixwell Avenue	Area Code 203 776-7201
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Florida, Orlando 32806 Electro Tech Inc. 307 - 27th Street	Area Code 305 423-5589
Georgia, Hapeville 30054 Electro-Tech, Inc. 3020 Commerce Way	Area Code 404 758-7205
Hawaii, Honolulu 96817 Electronic Systems Inc. 1622-26 Silva Street	851-457 811-132
Illinois, Chicago 60625 (Niles) A & M Instrument, Incorporated 7800 N. Merrimac	Area Code 312 966-8100
Illinois, Chicago 60644 Pacific Indicator Company 5924 W. Madison Street	Area Code 312 261-1330
Illinois, Chicago 60644 Simpson Electric Company 5200 W. Kinzie Street	Area Code 312 379-1121
Kansas, Shawnee Mission 66205 Sturtz Instrument Co. 4705 Mission	Area Code 913 236-4705
Louisiana, New Orleans 70115 Industrial Instrument Works 3305 Tchoupitoulas Street	Area Code 504 895-5621
Maryland, Beltsville 20705 Meter Devices Inc. 11325 Maryland Ave.	Area Code 301 345-7775
Maryland, Timonium 21093 Edgerly Instrument Labs., Inc. 110 West Timonium Road	Area Code 301 252-1260
Massachusetts, Burlington 01803 The Mancib Co. Middlesex Turnpike at "A" St.	Area Code 617 272-9450

Massachusetts, Needham Heights 02194 Instruments, Incorporated 570 Hillside Avenue	Area Code 617 444-9410
Michigan, Detroit 48220 Ram Meter, Inc. 1100 Hilton Road Ferndale	Area Code 313 547-1000
Minnesota, Minneapolis 55411 Instrumentation Services Inc. 917 Plymouth Avenue	Area Code 612 521-8803
Missouri, St. Louis 63112 Scherrer Instruments 5449 Delmar Blvd.	Area Code 314 367-9800
New Jersey, Belleville 07109 Marshall Instruments, Inc. 236 Washington Avenue	Area Code 201 751-1190
New York, Buffalo 14216 Electrical Instrument Labs. 932 Hertel Avenue	Area Code 716 876-0880
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New York, New York 10011 Electro-Tech Equipment Company 85 Tenth Avenue	Area Code 212 675-2400
New York, Syracuse 13215 Syracuse Instrument Lab. 4895 South Avenue Box 96	Area Code 315 492-1651
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Ohio, Cleveland 44103 Pioneer-Standard Electronics, Inc. 5403 Prospect Avenue	Area Code 216 432-0010
Ohio, Dayton 45404 SREPCO Electronics Div. of Pioneer Standard Electronic, Inc. 314 Leo Street	Area Code 513 224-0871
Oregon, Portland 97217 Industrial Instrument Repair Lab. 1910 N. Killingsworth St.	Area Code 503 285-6629
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Wisconsin, Milwaukee 53202 The Electro-Mechano Company 261 East Erie Street	Area Code 414 272-4050

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If you run tests on communication systems, motors, wiring, appliances, tubes, components, batteries, or coolers, these nifty little testers are just what you're looking for. Micro-Testers measure only 3" x 5⅜" x 2½". They give you Simpson quality in a tester that is compact in both size and price. *All 18 are in stock for immediate delivery. Call your Electronics Distributor or the factory for Bulletin 2066.*

AC/DC VOLT-OHM-MILLIAMMETER: 12 ranges	Model 230	$43.00
AC/DC VOLT-OHM-MILLIAMMETER: 14 ranges	Model 240	43.00
OHMMETER: 6 ranges, 0 ohms to 50 meg.	Model 372	37.00
LOW-OHMMETER: 0-5, 0-25 ohms	Model 362	37.00
AC AMMETER: 0-1, 2.5, 5, 10, 25 amp. ±5% FS	Model 370	37.00
DC AMMETER: 0-1, 2.5, 5, 10, 25 amp. ± 3% FS	Model 375	37.00
AC MILLIAMMETER: 0-5, 25, 100, 250, 1000 ma, ± 5% FS	Model 378	37.00
DC MILLIAMMETER: 0-1, 5, 10, 25, 50, 100, 250, 1000 ma, ± 3% FS	Model 373	37.00
DC MICROAMMETER: 0-50, 100, 250, 500, 1000, ua ± 3% FS	Model 374	37.00
AC VOLTMETER: 0-5, 10, 25, 50, 100, 250, 500, 1000 v, ± 5% FS	Model 376	37.00
AC VOLTMETER: 0-150, 300, 600 v, ± 3% FS	Model 371	37.00
DC VOLTMETER: 10 ranges, 0 to 1000 v, ± 3% FS	Model 377	37.00
DC MILLIVOLTMETER: 0-10, 30, 100, 300, 1000 mv, ± 3% FS	Model 387	37.00
AC VOLT-AMP-WATTMETER: 8 ranges (300 v, 15 a, 3000 w. max) ± 5% FS	Model 390	65.00
AC/DC VOLT-WATTMETER: 4 ranges (260 v, 3000 w, max) ± 5% FS	Model 391	59.00
AC/DC VOLT-WATTMETER: 4 ranges (260 v, 5000 w, max) ± 5% FS	Model 392	64.00
BATTERY TESTER: for radios, flashlights, hearing aids	Model 379	37.00
TEMPERATURE METER: −50° to +70°F (up to 3 temp. one time)	Model 385-3L	43.00

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INSTRUMENTS THAT STAY ACCURATE

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5206 W. Kinzie Street, Chicago, Ill. 60644
Phone: (312) EStebrook 9-1121
In Canada:
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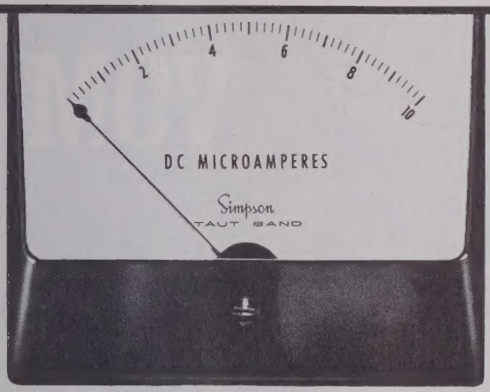
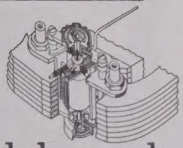




here's the taut band reliability you should demand

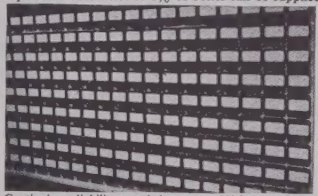
Simpson's search for reliability began at a major source of trouble—the overly complicated design of conventional Taut Band suspensions. The result was an improved suspension with 25% fewer parts.

Because of this, you would expect life expectancy to zoom, and trouble to nose dive. And that's just what happened.

The Ultimate in Test Programs—As just one step in a comprehensive test program to insure reliability measuring up to today's needs, Simpson engineers put 150 of the improved Taut Band meters on a continuing 24-hour test (cycled zero to full scale 2200 times per hour). As of August 30, 1964, the 150 meters have logged 25,243,000 cycles without failure. This is equivalent to over 70 years of normal operation. Weekly calibration checks show that the meters are holding ± ½% accuracy. Simpson Taut Band meters also passed ASA tests for extreme temperature, humidity, shock, and vibration.

Stocked for Immediate Delivery—Present units stocked are microammeters in 2½", 3½", and 4½" sizes. Ranges are 10, 15, 25, 50, 100 ua; accuracy, ± 2% F.S. *For fast service, call your distributor.*

Special Requirements—Contact your Simpson representative or the factory. Sensitivities as low as 2 microamperes at accuracies of 1% or better can be supplied.



Continuing reliability tests being run on 150 improved Taut Band meters with 20 pivot-jewel meters used as control units.

WRITE FOR Bulletin PM-505.

Simpson

DIVISION

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INSTRUMENTS THAT STAY ACCURATE

GOOF-PROOF VOM

Here's the most foolproof volt-ohm-milliammeter ever made. Protection approaches 100%. It's the VOM you will want to have on hand where inexperienced people are running tests . . . or will reach for yourself on those days when you're all thumbs. The 260-5P will save you all kinds of headaches from burned out meters and resistors, bent pointers, and inaccuracies caused by overheating.

SIMPSON 260-5P

Combined Protection You Won't Find In Any Other VOM

1. Reset button pops out to indicate overload.
2. You cannot reset circuits while overload is present.
3. Protective circuit does *not require* massive overloads which can cause hidden damage to the instrument.
4. All ranges are protected except those not feasible in a portable instrument—1000 and 5000 volts DC and AC; 10 amp DC.

Ranges—The 260-5P has the same ranges and takes the same accessories as Simpson's famous 260-4 VOM.

Simpson

Representatives in Principal Cities ...See Telephone Yellow Pages

DIVISION

SIMPSON ELECTRIC COMPANY
5202 W. Kinzie Street, Chicago, Ill. 60644 • Phone: (312) EStebrook 9-1121
Export Dept.: 400 W. Madison Street, Chicago, Ill. 60606 Cable, Amergaco

In Canada: Bach-Simpson Ltd., London, Ontario
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WORLD'S LARGEST MANUFACTURER OF ELECTRONIC TEST EQUIPMENT

Warranty

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

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AGM DIVISION

Quality is the indispensable component
of every Simpson instrument . . . . . .